REMARKS

Claims 1-36 are pending in this application. All of the claims were rejected. Claims 1, 8, 15, 20 and 34 are currently amended. Reconsideration is respectfully requested.

Claim 1 was rejected under 35 U.S.C. §112 as being indefinite. It appears that the Office has interpreted some terms in a manner which is unconventional in the art and contradictory to the Specification. As a starting point it may be useful to outline the points of confusion. The "data path" and "control path" of a router are not mechanisms for communication between network nodes, but rather are mechanisms for processing packets within the node itself.[1] Once a packet is on the wire between nodes it is not practical to determine whether that packet was processed on the data path or the control path. Further, the terms "data path" and "control path" are not used to describe wires of different lengths, but rather different processing paths which typically involve different hardware, software and even different protocols.[2] When a multicast packet enters the router, a determination is made as to whether the data path includes forwarding information for that packet.[3] That forwarding information can be in one or more forwarding tables, and may be in the form of an indication of output ports indexed by source address and group.[4] If such an entry exists, the ports are identified from the table entry and the packet is forwarded to the indicated ports on the data path.[5] Since this process is relatively fast, the data path is sometimes called the "fast path." However, if the forwarding tables have no entry for that

[1] See Specification page 5, lines 12-28
[2] Id.
[3] page 5, lines 1-2
[4] page 5, lines 2-6, 29-32, page 6, lines 1-3
[5] page 6, lines 20-23

source address then the router does not know which ports to use.[6] In this case the router typically utilizes the control path. The control path buffers the multicast packet while the router determines, via communication with other routers, which are the appropriate ports for the multicast packet. The requisite communications between routers cause the control path to be slower than the data path. Indeed, the control path may be so slow that buffer overflow can occur and the multicast packet can be dropped. A solution to this problem, in accordance with claim 1, is to broadcast the multicast packet that cannot be processed by the data path (and subsequently identify the correct list of ports so an entry can be made in data path memory). A "broadcast," as that term is used in the art and the Specification, typically involves forwarding to all ports without regard for whether or not those ports are associated with destinations.[7] Obviously, this results in some wasted bandwidth since packets forwarded through ports not actually associated with destinations serve no particular purpose and are eventually dropped. However, the advantage of the technique is that it can be done quickly, without the processing overhead normally associated with determining the appropriate ports via the control path, i.e., broadcasting does not require the communications with other nodes to eliminate some of the ports. In other words, bandwidth is traded for speed in order to help avoid packet drop. Since it may be possible to eliminate some ports as candidates without even communicating with other nodes, the claim recites "that could possibly be associated with a destination of the multicast data." For example, the port on which the packet was received might be eliminated, as might ports reserved for management traffic. Having broadcast the packet, the control path can be utilized to identify the

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[6] page 6, lines 24-25

[7] See page 6, line 30-page 7, line 3. The distinction between multicast with broadcast is not whether transmission is simultaneous (N.B. MC transmission may not be simultaneous because of differences in output queue loading), but rather in whether or not the proper output ports are identified. In broadcast, the appropriate output ports are unknown, whereas in a multicast transmission the appropriate output ports are known.

proper output ports for subsequent packets of the same (source, group) without great concern for the delay caused by communications between nodes.

Applicant has amended claim 1 and corresponding independent claims 8, 15, 20 and 34 to further emphasize and clarify the meaning of some of the terms discussed above. For example, the data path is now recited to be "within the router," rather than "of the router," where appropriate. Similarly, the forwarding information is recited to be included "in memory," and characterized as specifically identifying at least one port associated with a destination of the multicast data. Still further, claims 1, 8 and 15 recite that the ports determined via the control path subsequent to the broadcast are used to update the data path memory.

With regard to the rejections under §103(a) based on Acharya, the presently claimed invention distinguishes that reference because when the data path does not include forwarding information for the multicast data, the multicast data is broadcast from each port of the router that could possibly be associated with a destination of the multicast data, after which the control path is utilized to determine the subset of ports actually associated with destinations in order to update forwarding tables. Claim 1, for example, recites "determining whether a data path within the router includes, in memory, forwarding information for the multicast data which specifically identifies at least one port associated with a destination of the multicast data; if the data path does not include the forwarding information for the multicast data, broadcasting the multicast data from each port of the router that could possibly be associated with a destination of the multicast data; and subsequent to broadcasting the multicast data, determining via a control path which ports of the router are actually associated with a destination of the multicast data, and storing a specific indication of those ports in the memory of the data path." Acharya states at col. 7, lines 31-42, "since the VC picked by the Source Node is unknown to the first ATM switch, this first

ATM switch will direct the connectionless IP packet received to the IP router it is connected to, for IP level processing (routed mode) … while the packet is being processed by the IP router to determine its next hop, any successive ATM cells associated with that packet are stored in a buffer particular to that VC … **after the next hop is determined** … the stored cells are directed to an actual port." As discussed above, the delay in determining the next hop in combination with a relatively full buffer can result in those buffered packets being dropped. The presently claimed invention helps solve this problem by **broadcasting those packets before determining the next hop**. Each of the independent claims recite this distinguishing feature. Since Acharya teaches directly against the claimed technique, the rejection of claims 1-36 should be withdrawn, and such action is requested.

Applicants have made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone the undersigned, Applicants' Attorney at 978-264-4001 (X305) so that such issues may be resolved as expeditiously as possible. For these reasons, and in view of the above amendments, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Respectfully Submitted,

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